

# PATENT ABSTRACTS OF JAPAN

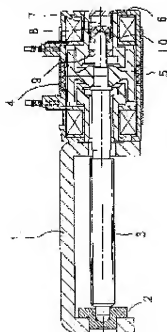
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(21)Application number : 2002-018110 (71)Applicant : CANON ELECTRONIC S INC  
(22)Date of filing : 28.01.2002 (72)Inventor : CHISHIMA YOSHINORI

## (54) STEPPING MOTOR



## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a stepping motor which reduces vibration.

SOLUTION: In the stepping motor fitted with a lead screw, where an output shaft is provided with a screw which is supported rotatably with its one end in axially immobile state and is supported rotatably, with its other end in axially energized state and which has a sending thread made, the first bearing for regulating the radial

direction of the motor shaft and the second bearing for

energizing the motor shaft in the axial direction by a spring are provided separately, the first bearing for regulating the radial direction of the motor shaft is press-fitted in a peripheral cylinder within a motor, the second bearing for energizing the motor shaft in the axial direction by the spring is arranged between the motor shaft and the spring, and it has a form such that its one part is inserted inside the spring energizing the motor shaft as a rotatable bearing.

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## CLAIMS

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[Claim(s)]

[Claim 1] In order to lose backlash of shaft orientations, while one end is supported by shaft orientations by immobilite, enabling free rotation and the other end is supported by shaft orientations by an energizing state, enabling free rotation, In a stepping motor with a lead screw which provided a screw in which a feed screw slot was formed in an output shaft, The 2nd bearing part for energizing a motor shaft in the direction of a motor shaft with the 1st bearing part and a spring which regulate a radial direction of a motor shaft is divided and arranged, Press fit immobilization of the 1st bearing part that regulates a radial direction of a motor shaft is carried out at a motor inside-and-outside circumference body, The 2nd bearing for carrying out motor shaft alignment vigor of the motor shaft with a spring is arranged between a motor shaft and a spring, A stepping motor having the shape by which a part is inserted in an inside of a path of a spring which is energizing a motor shaft as a bearing which can be rotated aiming at telling a stable energizing state to a motor shaft.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the stepping motor carried in a digital camera etc.

[0002]

[Description of the Prior Art] Conventionally, the structure of a stepping motor is shown in drawing 2, and motor bearing structure touches a motor inside-and-outside periphery with cylindrical shape, It is possible to store the spring for having an insert portion which receives a motor shaft and energizing a motor shaft in an inside, It is that the holder part of the motor shaft of a bearing is positioned in the form put ahead of a spring part, and a bearing is always energized by this structure with a spring, The motor shaft inserted in the bearing will always be energized ahead, and also it comprises forming a bearing in the cylindrical shape which touches a motor inside-and-outside periphery so that Bore of the hand of cut of a motor shaft may be regulated by a motor inside-and-outside periphery.

[0003]

[Problem(s) to be Solved by the Invention] However, since it is a form where the motor shaft receiving part of a bearing is put ahead of a spring in a conventional example, are unstable, The cylindrical shape which is a bearing outside since it is the shape which stores a spring in a bearing, That is, it is necessary to make a bearing large to a spring pressing direction, and although cylindrical shape is also the shape which touches a motor inside-and-outside periphery, in the direction of a motor shaft, it must move by spring press, Since it is shape setting out which produces a crevice not a little also about a contact

portion with a motor inside-and-outside periphery, The rotation was transmitted to the bearing by rotation of the motor shaft, the bearing produced rotational vibration by it, and there was a fault which is generating the vibration sound because a bearing cylindrical shape outside part and a motor inside-and-outside periphery repeat contact by the vibration.

[0004]Therefore, the purpose of this invention is to provide the stepping motor which reduces vibration.

[0005]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, a stepping motor of this invention, In order to lose backlash of shaft orientations, while one end is supported by shaft orientations by immobilite, enabling free rotation and the other end is supported by shaft orientations by an energizing state, enabling free rotation, In a stepping motor with a lead screw which provided a screw in which a feed screw slot was formed in an output shaft, The 2nd bearing for energizing a motor shaft in the direction of a motor shaft with the 1st bearing and a spring which regulate a radial direction of a motor shaft is divided and arranged, Press fit immobilization of the 1st bearing that regulates a radial direction of a motor shaft is carried out at a motor inside-and-outside circumference body, The 2nd bearing for carrying out motor shaft alignment vigor of the motor shaft with a spring is arranged between a motor shaft and a spring, and it has the shape by which a part is inserted in an inside of a path of a spring which is energizing a motor shaft as a bearing which can be rotated aiming at telling a stable energizing state to a motor shaft.

[0006]A bearing for energizing a motor shaft in the direction of a motor shaft in the above-mentioned composition with a bearing and a spring which regulate a radial direction of a motor shaft is divided and arranged, A bearing which regulates a radial direction of a motor

shaft is cylindrical ring form, Press fit immobilization is carried out at a motor inside-and-outside circumference body, and a bearing for energizing a motor shaft in the direction of a motor shaft with a spring is arranged between a motor shaft and a spring, By having the shape by which a part is inserted in an inside of a path of a spring which is energizing a motor shaft in the direction of a motor shaft as a bearing aiming at telling stable spring pressure to a motor shaft. Bearing-surface products which touch a motor inside-and-outside circumference body in response to vibration of a motor shaft are reducible only to a bearing for motor shaft alignment vigor, To vibration by drive of a motor shaft, contact of a motor inside-and-outside circumference body and a bearing is reduced, and can reduce a vibration sound of a motor, and. Also from a bearing mechanism of a motor shaft hand of cut not contacting a spring for motor shaft alignment vigor, either, a bearing which vibrates by motion of a spring by motor shaft rotation can reduce only to a bearing for motor shaft alignment vigor, and a vibration sound of a motor can be reduced.

[0007]

[Embodiment of the Invention]In [ drawing 1 is a sectional view of the stepping motor of this invention, and ] drawing 1, 1 -- a tie-down plate and 2 -- tip bearing and 3 -- a motor shaft and 4 -- as for a motor inside-and-outside circumference body and 8, a magnetizing magnet and 6 are [ a motor shaft radial direction regulation shaft carrier and 10 ] motor shaft alignment vigor bearings a bearing energization spring and 9 a spring pressing plate and 7 a motor section and 5.

[0008]In the above-mentioned composition, by magnetic flux occurring and a magnetic path being formed in a motor, by sending current through the coil of the motor section 4, the magnetizing magnet 5 rotates and the motor shaft 3 by which the assembly is carried out to the magnet 5 in the

rotational movement rotates. Then, the motor shaft alignment vigor bearing 10 currently pressed by the motor shaft 3 with the bearing energization spring 8 also follows rotation of the motor shaft 3, and rotates within the motor inside-and-outside circumference body 7, by it, the motor shaft alignment vigor bearing 10 and the motor inside-and-outside circumference body 7 contact, and vibration takes place.

[0009]However, the motor shaft radial direction regulation shaft carriers 9 are the motor shaft alignment vigor bearing 10 and the divided different body, and since the motor inside-and-outside circumference body 7 \*\*\*\*\*, they do not follow rotation of the motor shaft 3. And the motor shaft 3 for the motor shaft 3 to always rotate in a stable position is considered as per degree by the tip bearing 2, Tie with the motor section 4 via the tie-down plate 1, and the reverse side edge (inside of a motor) of the motor shaft 3 is inserted in the motor shaft hand-of-cut regulation shaft carrier 9 at the through motor shaft alignment vigor bearing 10, The motor shaft 3 is maintained to the stable position by always energizing [ the bearing ] the motor shaft 3 for the motor shaft 3 to tip bearing side 2 by the spring pressure of the bearing energization spring 8.

[0010]Here, since the motor shaft alignment vigor bearing 10 always needs to tell the spring pressure of the bearing energization spring 8 to the motor shaft 3, it is necessary to move to motor shaft 3 cross direction within the motor inside-and-outside circumference body 7, and, therefore, the outer diameter of the motor shaft cross-direction energization bearing 10 is small formed from the path of the motor inside-and-outside circumference body 7.

[0011]The bearing for energizing a motor shaft in the direction of a motor shaft in the above example with the bearing and spring which regulate the radial direction of a motor shaft is divided and arranged, The bearing which

regulates the radial direction of a motor shaft is cylindrical ring form, Press fit immobilization is carried out at a motor inside-and-outside circumference body, and the bearing for energizing a motor shaft in the direction of a motor shaft with a spring is arranged between a motor shaft and a spring, By having the shape by which a part is inserted in the inside of the path of the spring which is energizing the motor shaft in the direction of a motor shaft as a bearing aiming at telling the stable spring pressure to a motor shaft. The bearing-surface products which touch a motor inside-and-outside circumference body in response to vibration of a motor shaft are reducible only to the bearing for motor shaft alignment vigor, To vibration by the drive of a motor shaft, contact of a motor inside-and-outside circumference body and a bearing is reduced, and can reduce the vibration sound of a motor, and. Also from the bearing mechanism of a motor shaft hand of cut not contacting the spring for motor shaft alignment vigor, either, the bearing which vibrates by motion of the spring by motor shaft rotation can reduce only to the bearing for motor shaft alignment vigor, and the vibration sound of a motor can be reduced.

[0012]

[Effect of the Invention]The bearing for energizing a motor shaft in the direction of a motor shaft with the bearing and spring which regulate the radial direction of a motor shaft according to this invention, as explained above is divided and arranged, The bearing which regulates the radial direction of a motor shaft is cylindrical ring form, Press fit immobilization is carried out at a motor inside-and-outside circumference body, and the bearing for energizing a motor shaft in the direction of a motor shaft with a spring is arranged between a motor shaft and a spring, By having the shape by which a part is inserted in the inside of the path of the spring which is energizing the motor shaft in the direction of a motor shaft as a



bearing aiming at telling the stable spring pressure to a motor shaft. The bearing-surface products which touch a motor inside-and-outside circumference body in response to vibration of a motor shaft are reducible only to the bearing for motor shaft alignment vigor, To vibration by the drive of a motor shaft, contact of a motor inside-and-outside circumference body and a bearing is reduced, and can reduce the vibration sound of a motor, and. Also from the bearing mechanism of a motor shaft radial direction not contacting the spring for motor shaft alignment vigor, either, the bearing which vibrates by motion of the spring by motor shaft rotation can reduce only to the bearing for motor shaft alignment vigor, and it becomes possible to reduce the vibration sound of a motor.

[0013]Of course, in order to aim at telling the stabilized energizing state where the bearing shape for energizing in the direction of a motor shaft has been arranged between a motor shaft and a spring to a motor shaft, arbitrary shape other than the above-mentioned example (for example, disc shape, saucer shape, etc.) may be sufficient.

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**TECHNICAL FIELD**

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[Field of the Invention]This invention relates to the stepping motor carried in a digital camera etc.

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## PRIOR ART

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[Description of the Prior Art]Conventionally, the structure of a stepping motor is shown in drawing 2, and motor bearing structure touches a motor inside-and-outside periphery with cylindrical shape, It is possible to store the spring for having an insert portion which receives a motor shaft and energizing a motor shaft in an inside, It is that the holder part of the motor shaft of a bearing is positioned in the form put ahead of a spring part, and a bearing is always energized by this structure with a spring, The motor shaft inserted in the bearing will always be energized ahead, and also it comprises forming a bearing in the cylindrical shape which touches a motor inside-and-outside periphery so that Bure of the hand of cut of a motor shaft may be regulated by a motor inside-and-outside periphery.

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## EFFECT OF THE INVENTION

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[Effect of the Invention]The bearing for energizing a motor shaft in the direction of a motor shaft with the bearing and spring which regulate the radial direction of a motor shaft according to this invention, as explained above is divided and arranged, The bearing which regulates the radial direction of a motor shaft is cylindrical ring form, Press fit immobilization is carried out at a motor inside-and-outside circumference body, and the bearing for energizing a motor shaft in the direction of a motor shaft with a spring is arranged between a motor shaft and a spring, By having the shape by which a part is inserted in the inside of the path of the spring which is energizing the motor shaft in the direction of a motor shaft as a bearing aiming at telling the stable spring pressure to a motor shaft. The bearing-surface products which touch a motor inside-and-outside circumference body in response to vibration of a motor shaft are reducible only to the bearing for motor shaft alignment vigor, To vibration by the drive of a motor shaft, contact of a motor inside-and-outside circumference body and a bearing is reduced, and can reduce the vibration sound of a motor, and. Also from the bearing mechanism of a motor shaft radial direction not contacting the spring for motor shaft alignment vigor, either, the bearing which vibrates by motion of the spring by motor shaft rotation can reduce only to the bearing for motor shaft alignment vigor, and it becomes possible to reduce the vibration sound of a motor.

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#### TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention]However, since it is a form where the motor shaft receiving part of a bearing is put ahead of a spring in a conventional example, are unstable, The cylindrical shape which is a bearing outside since it is the shape which stores a spring in a bearing, That is, it is necessary to make a bearing large to a spring pressing direction, and although cylindrical shape is also the shape which touches a motor inside-and-outside periphery, in the direction of a motor shaft, it must move by spring press, Since it is shape setting out which produces a crevice not a little also about a contact portion with a motor inside-and-outside periphery, The rotation was transmitted to the bearing by rotation of the motor shaft, the bearing produced rotational vibration by it, and there was a fault which is generating the vibration sound because a bearing cylindrical shape outside part and a motor inside-and-outside periphery repeat contact by the vibration.

[0004]Therefore, the purpose of this invention is to provide the stepping motor which reduces vibration.

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## MEANS

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[Means for Solving the Problem] In order to attain the above-mentioned purpose, a stepping motor of this invention, In order to lose backlash of shaft orientations, while one end is supported by shaft orientations by immobilite, enabling free rotation and the other end is supported by shaft orientations by an energizing state, enabling free rotation, In a stepping motor with a lead screw which provided a screw in which a feed screw slot was formed in an output shaft, The 2nd bearing for energizing a motor shaft in the direction of a motor shaft with the 1st bearing and a spring which regulate a radial direction of a motor shaft is divided and arranged, Press fit immobilization of the 1st bearing that regulates a radial direction of a motor shaft is carried out at a motor inside-and-outside circumference body, The 2nd bearing for carrying out motor shaft alignment vigor of the motor shaft with a spring is arranged between a motor shaft and a spring, and it has the shape by which a part is inserted in an inside of a path of a spring which is energizing a motor shaft as a bearing which can be rotated aiming at telling a stable energizing state to a motor shaft.

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[0007]

[Embodiment of the Invention]In [ drawing 1 is a sectional view of the stepping motor of this invention, and ] drawing 1, 1 -- a tie-down plate and 2 -- tip bearing and 3 -- a motor shaft and 4 -- as for a motor inside-and-outside circumference body and 8, a magnetizing magnet and 6 are [ a motor shaft radial direction regulation shaft carrier and 10 ] motor shaft alignment vigor bearings a bearing energization spring and 9 a spring pressing plate and 7 a motor section and 5.

[0008]In the above-mentioned composition, by magnetic flux occurring and a magnetic path being formed in a motor, by sending current through the coil of the motor section 4, the magnetizing magnet 5 rotates and the motor shaft 3 by which the assembly is carried out to the magnet 5 in the rotational movement rotates. Then, the motor shaft alignment vigor bearing 10 currently pressed by the motor shaft 3 with the bearing energization spring 8 also follows rotation of the motor shaft 3, and rotates within the motor inside-and-outside circumference body 7, by it, the motor shaft alignment vigor bearing 10 and the motor inside-and-

outside circumference body 7 contact, and vibration takes place.

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inserted in the inside of the path of the spring which is energizing the motor shaft in the direction of a motor shaft as a bearing aiming at telling the stable spring pressure to a motor shaft. The bearing-surface products which touch a motor inside-and-outside circumference body in response to vibration of a motor shaft are reducible only to the bearing for motor shaft alignment vigor, To vibration by the drive of a motor shaft, contact of a motor inside-and-outside circumference body and a bearing is reduced, and can reduce the vibration sound of a motor, and. Also from the bearing mechanism of a motor shaft hand of cut not contacting the spring for motor shaft alignment vigor, either, the bearing which vibrates by motion of the spring by motor shaft rotation can reduce only to the bearing for motor shaft alignment vigor, and the vibration sound of a motor can be reduced.

## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] Drawing 1 is a sectional view of the stepping motor of this invention.

[Drawing 2] Drawing 2 is a sectional view of the stepping motor of a conventional example.

[Description of Notations]

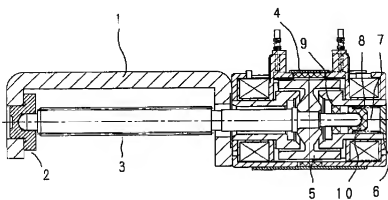
- 1 ... Tie-down plate
- 2 ... Tip bearing
- 3 ... Motor shaft
- 4 ... Motor section
- 5 ... Magnetizing magnet
- 6 ... Spring pressing plate
- 7 ... Motor inside-and-outside circumference body
- 8 ... Bearing energization spring
- 9 ... Motor shaft radial direction regulation shaft carrier
- 10 ... Motor shaft alignment vigor bearing
- 11 ... Motor bearing

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## DRAWINGS

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[Drawing 1]



[Drawing 2]

